

# TEST REPORT



1. No : CT15-073346
2. Client :
  - Name : PT.TOILON INDONESIA
  - Address : JL.ROYA SERANG KM 16.8 DESA TELAGA CIKUPA TANGERANG INDONESIA
  - Date of Receipt : Jun 30, 2015
  - TESTING PERIOD : 2015.06.30 ~ 2015.07.20
3. Use of Report : Submission to customer
4. Test Sample : CROSS LINKED PE FOAM
5. Method :
  - (1) ASTM C423-09a

Affirmation	Tested By Name : Kim, Yong Hee	Technical Manager Name : Cho Jae Woo
Our report apply only to the standards or procedures identified and to the sample(s) tested unless otherwise specified. The test results are not indicative of representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products.		

2015.07.20

**Korea Conformity Laboratories**

President

Kim, Kyungsik

*Kyungsik Kim*

The above test certificate is the accredited test results by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.



**PT. Thermo Tech Solutions**  
JAKARTTA

*[Handwritten signature]*

Address : 363-883 73, Yangcheong 3-gil, 0chang-eup, Cheongwon-Gu, Cheongju-Si, Chungbuk, Korea  
 82-43-210-8990  
 Result Inquiry : Built Environment Materials Center 82-43-210-8922



# TEST REPORT



No : CT15-073346

## 6. Test Results

### 1) CROSS LINKED PE FOAM

Test Item(s)	Unit	Test method	Test Results	Testing Environment
Absorption coefficient [ 1/3 octave band center frequency 100 Hz ]	-	(1)	0.03	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 125 Hz ]	-	(1)	0.03	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 160 Hz ]	-	(1)	0.05	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 200 Hz ]	-	(1)	0.08	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 250 Hz ]	-	(1)	0.09	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 315 Hz ]	-	(1)	0.14	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 400 Hz ]	-	(1)	0.20	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 500 Hz ]	-	(1)	0.30	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 630 Hz ]	-	(1)	0.54	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 800 Hz ]	-	(1)	0.70	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 1 000 Hz ]	-	(1)	0.65	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 1 250 Hz ]	-	(1)	0.53	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 1 600 Hz ]	-	(1)	0.59	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 2 000 Hz ]	-	(1)	0.70	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 2 500 Hz ]	-	(1)	0.81	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 3 150 Hz ]	-	(1)	0.84	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 4 000 Hz ]	-	(1)	0.70	(28 ± 1) °C, (63 ± 3) % R.H.
Absorption coefficient [ 1/3 octave band center frequency 5 000 Hz ]	-	(1)	0.67	(28 ± 1) °C, (63 ± 3) % R.H.
Noise Reduction Coefficient (NRC)	-	(1)	0.45	(28 ± 1) °C, (63 ± 3) % R.H.

※ Test environmental condition (empty room) : air temperature (27 ± 1) °C, humidity (59 ± 3) % R.H.

※ Composition of test specimen (presented by client)

o Installation area : 10.81 m<sup>2</sup> (width 3 053 mm × length 3 539 mm)

o Unit specimen size : width 800 mm × length 3 539 mm × thickness 8 mm

o Overlapped installation of twofold specimen (PE foam of density 33 kg/m<sup>3</sup>) of thickness 8 mm (A-mounting according to ASTM E795-05)

--- End of Report ---



PT. Thermo Tech Solutions  
JAKARTA

*[Handwritten signature]*



# TEST REPORT



No : CT15-073346

Descriptions	Contents	
Date of test	2015/07/16	
Overview	<p>This test measured absorption coefficients of <b>CROSS LINKED PE FOAM</b> of PT.TOILON INDONESIA through ASTM C423-09a (Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method), and the measured frequency range was 100 Hz to 5 000 Hz in 1/3 octave bands.</p>	
Composition of test specimen	<ul style="list-style-type: none"> <li>o Installation area : 10.81 m<sup>2</sup> (width 3 053 mm × length 3 539 mm)</li> <li>o Unit specimen size : width 800 mm × length 3 539 mm × thickness 8 mm</li> <li>o Overlapped installation of twofold specimen (PE foam of density 33 kg/m<sup>3</sup>) of thickness 8 mm (A-mounting according to ASTM E795-05).</li> </ul> <p>※ The composition of test specimen was presented by client.</p>	
Measuring device	Reverberation room	<p>Structure : Reinforced concrete (wall thickness : 250 mm)</p> <p>Shape : Atypical heptahedron</p> <p>Volume : 209.7 m<sup>3</sup></p> <p>Surface area : 203.9 m<sup>2</sup></p> <p>Diffuser : suspended ceiling diffusers (15 m<sup>2</sup>)</p>
	Real Time Analyzer	PAK MK II, MÜLLER-BBM, Germany
	1/2" Condenser Microphone	40AE, G.R.A.S., Denmark
	Sound Level Calibrator	Cal-02, 01dB, France
	Power Amplifier	CONA V2-5000, Inter-M, Korea
	Loudspeaker	DO12, FALM, Germany
	Control PC	Workstation Xeon 4, HP, U.S.A.



# TEST REPORT



No : CT15-073346

Descriptions	Contents
Test method	<p>Absorption coefficient was derived as following equations by measuring reverberation time before and after installation of the test specimen inside reverberation room according to ASTM C423-09a (Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method).</p> <p><b>A. Measurement of reverberation time</b>                      Reverberation time was measured for two different sound sources at 6 omni-directional microphones. Spacing between microphones was more than 1.5 m, and spacing between each microphone and each sound source was more than 2 m. All microphones were more than 1 m apart from the test specimen surfaces.</p> <p><b>B. Calculation of absorption coefficient (<math>\alpha_s</math>)</b>  <math display="block">\alpha = (A_2 - A_1) / S</math>                     where <math>A_2</math> : equivalent absorption area of reverberation room including test specimen (<math>m^2</math>)  <math>A_1</math> : equivalent absorption area of empty reverberation room (<math>m^2</math>)  <math>S</math> : area covered by test specimen (<math>m^2</math>)</p> $A_x = 0.9210 \frac{V d_x}{c_x}$ where $x$ : Subscription by room condition, 1: empty room, 2: room with specimen $A_x$ : equivalent absorption area of reverberation room ( $m^2$ ) $V$ : volume of empty reverberation room ( $m^3$ ) $c_x$ : speed of sound in reverberation room (m/s) $c = 20.047 \sqrt{273.15 + t^{\circ}C}$ , $t$ : air temperature ( $^{\circ}C$ ) $d_x$ : decay rate (dB/s) $d_x = 60 / T_x$ (dB/s), $T_x$ : reverberation time (s) All decay rates in 1 000 Hz and above are adjusted due to air absorption by following equation $d_{air} = \frac{m_x c_x}{1000}$ (dB/s) $m_x$ : sound attenuation coefficient during measurement ( $m^{-1}$ ) <p><b>C. Calculation of Noise Reduction Coefficient (NRC)</b>                      Round the average of the sound absorption coefficients for 250, 500, 1 000 and 2 000 Hz to the nearest multiple of 0.05</p>



*[Handwritten signature]*



# TEST REPORT



No : CT15-073346

Test result			
Test name	Measurement of absorption coefficient	Specimen name	CROSS LINKED PE FOAM
Test method	ASTM C423-09a	Date of test	2015/07/16
Temperature	Empty room : (27 ± 1) °C Room with specimen : (28 ± 1) °C	Relative humidity	Empty room : (59 ± 3) % Room with specimen : (63 ± 3) %
Frequency (Hz)	Reverberation time of empty room $T_1$ (s)	Reverberation time of room with specimen $T_2$ (s)	Absorption coefficient $\alpha_s$
100	20.95	17.29	0.03
125	17.85	15.15	0.03
160	15.70	12.31	0.05
200	14.73	10.67	0.08
250	15.45	10.82	0.09
315	14.05	8.65	0.14
400	12.52	6.86	0.20
500	10.81	5.25	0.30
630	8.72	3.44	0.54
800	8.25	2.87	0.70
1 000	7.82	2.95	0.65
1 250	6.56	3.09	0.53
1 600	5.92	2.77	0.59
2 000	5.42	2.43	0.70
2 500	4.63	2.09	0.81
3 150	4.01	1.92	0.84
4 000	3.51	1.95	0.70
5 000	2.97	1.80	0.67
Noise Reduction Coefficient (NRC)			<b>0.45</b>

**Graph of the test result**

1/3 Octaveband Center Frequency (Hz)	Sound Absorption Coefficient
100	0.03
125	0.03
160	0.05
200	0.08
250	0.09
315	0.14
400	0.20
500	0.30
630	0.54
800	0.70
1000	0.65
1250	0.53
1600	0.59
2000	0.70
2500	0.81
3150	0.84
4000	0.70
5000	0.67

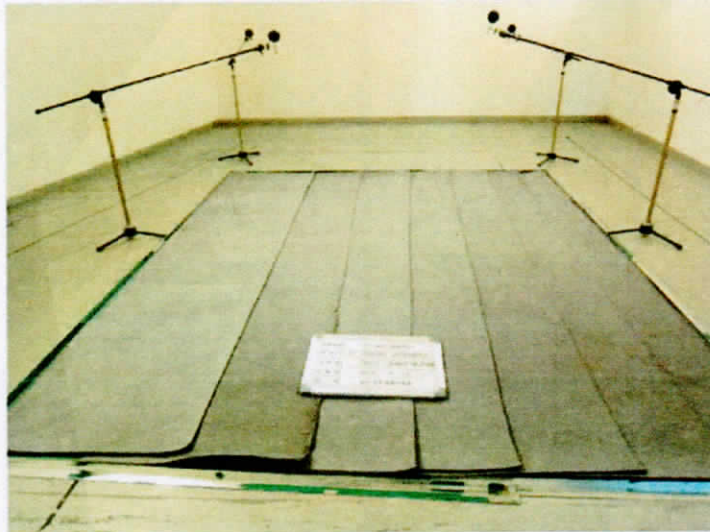


# TEST REPORT

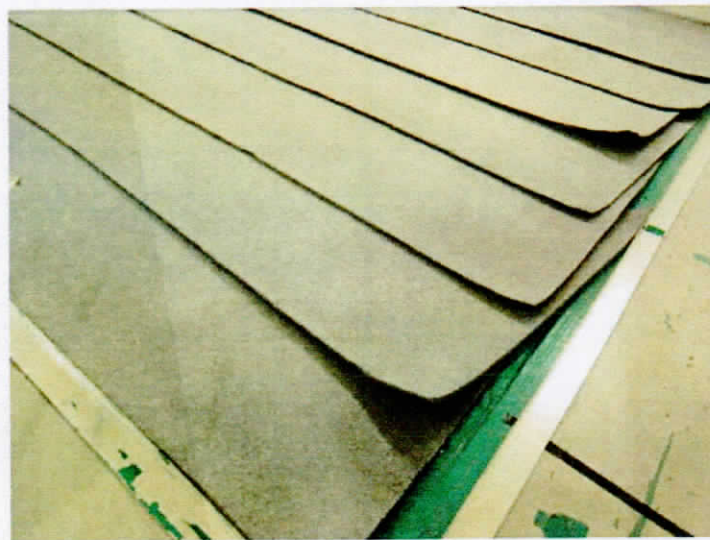


No : CT15-073346

Pictures of the test specimen



<Picture 1. Installation of the test specimen>



<Picture 2. Detail of the overlapped test specimen>

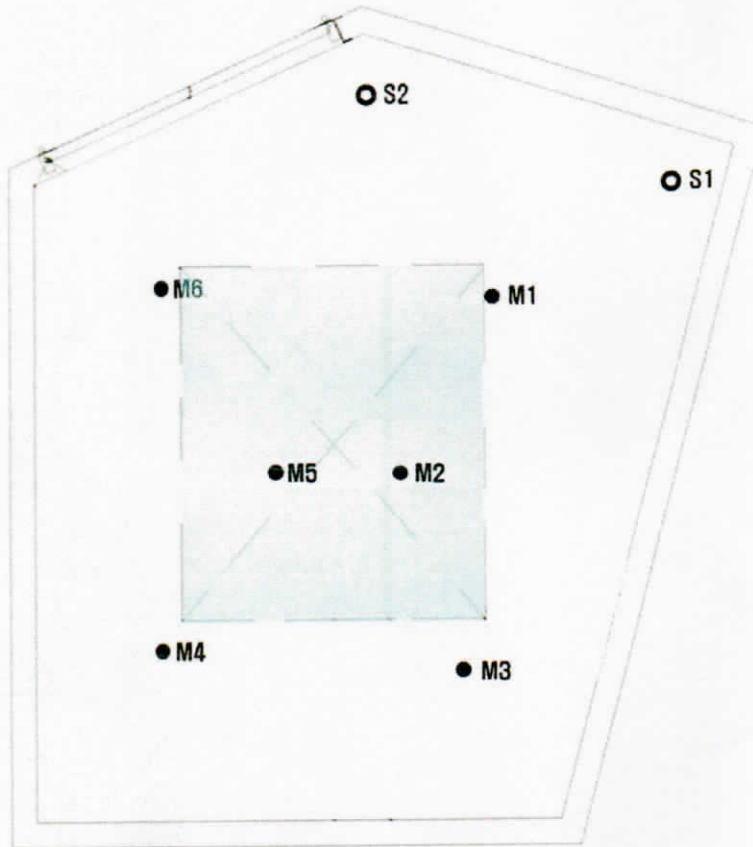


# TEST REPORT



No : CT15-073346

Positions of test specimen and source-and-receivers



- ※ M1 ~ M6 : Receiver positions (1.2 m height from specimen and floor surfaces)
- S1, S2 : Sound source positions
- : Position of the test specimen installed

----- End of Report -----

